



Design and Overall Mechanical Characteristics Analysis of Hybrid Composite Beam Single Tower Cable-Stayed Bridge

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Abstract

Composite beam bridges have been widely used in the main girders of cable-stayed bridges for their excellent performance. In order to study how to apply steel concrete composite girders and concrete π girders in single-tower cable-stayed bridges, the study explores the design technology of hybrid composite beam single-tower cable-stayed bridges based on Shouying Huaihe River Special Bridge of Hezhou Expressway. Through finite element analysis, a series of parametric analysis of the overall performance of the hybrid composite beam single-tower cable-stayed bridge is carried out to study the structural characteristics and analyze the rationality and economy of the structure. The result shows that the hybrid composite beam is a kind of single-tower cable-stayed bridge structure that can well adapt to the asymmetric span distribution with a large proportion of side and middle spans. The research results can provide support and guidance for the background engineering construction and help promote the application of the structural form.

Keywords: Hybrid composite beam cable-stayed bridge; steel concrete composite girder; design optimization; force analysis.

1 Introduction

A hybrid cable-stayed bridge refers to a cable-stayed bridge in which the main span of the bridge is a steel beam or a composite beam and the side span is a concrete beam. The main girder of cable-stayed bridge has a large span while the steel girder or composite girder is lighter in weight and has strong spanning capacity, which is very suitable

for the main span design of cable-stayed bridge^[1]. At the same time, the concrete beam has high self-weight and high rigidity. It is set on the side span, which can effectively balance the self-weight of the steel main beam or composite beam. For the hybrid cable-stayed bridge, the rational use of steel and concrete in the side and mid-span gives full play to their respective advantages. The ability to adapt to construction conditions has